

AMENDED CLAIMS WITH AMENDMENT MARKINGS

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1. A composite rigid foam structure comprising:
a rigid reticulated foam substrate having a surface and pores,
said pores having an average diameter, and
a formed in situ skin substantially uniformly bonded directly to
at least a portion of said surface, said skin generally penetrating
said rigid foam substrate to a depth of less than about 5 of said
average pore diameters, said skin having an [a substantially uniform]
interconnected porosity and adapted to allowing gas to flow through
said skin and out of said composite rigid foam structure.

2. A composite structure of claim 1, wherein said rigid
reticulated foam substrate comprises an inorganic material having at
least from about 20 to 30 pores per linear inch.

3. A composite structure of claim 1, wherein the rigid
reticulated foam substrate and the skin are made of about the same
inorganic materials.

4. The composite structure of claim 1, wherein at least one
of said rigid reticulated foam substrate and skin comprises metal.

5. The composite structure of claim 1, wherein said rigid
reticulated foam substrate and said skin comprise different metals.

6. The composite structure of claim 1, wherein at least one of said rigid reticulated foam substrate and skin comprises ceramic.

7. The composite structure of claim 1, wherein said rigid reticulated foam substrate comprises carbon.

8. The composite structure of claim 1, wherein at least one of said rigid reticulated foam substrate and skin comprises glass.

9. The composite structure of claim 1, wherein said rigid reticulated foam substrate and said skin comprise polymers.

10. The composite structure of claim 1, wherein one of said rigid reticulated foam substrate and said skin comprises metal and the other comprises ceramic.

11. The composite structure of claim 1, wherein said rigid reticulated foam substrate comprises ceramic and said skin is comprises molybdenum disilicide.

12. The composite structure of claim 1 wherein the continuous skin has penetrated into said rigid reticulated foam substrate for a depth of less than approximately 2 average pore diameters.

13. A method of forming a composite rigid foam structure comprising:

selecting a solid three-dimensional rigid foam substrate having at least one surface and pores, said pores in said foam substrate being defined by their peripheries and having an average diameter, and

thermally spraying a material that is at least partially fluid onto said surface to form a solid phase skin on said surface, said skin being attached to substantially all of said peripheries, and said skin extending no more than about 5 average pore diameters into said rigid foam substrate.

14. A method of forming a composite foam structure of claim 13 including selecting a hollow three-dimensional rigid foam substrate having inner and outer surfaces, and thermally spraying said material on at least one of said inner and outer surfaces.

REMARKS

Reconsideration of this application in view of the foregoing amendments and the following remarks is respectfully requested.

New drawings, as previously approved, are enclosed herewith.

Claims 1-12 have been amended and all of the claims in the application (including non-elected) are reproduced herein. Claim 1 has been amended to more clearly define the invention. Claims 2-12 have been amended to conform to claim 1.

Page 1 of the specification has been amended.

Many of the outstanding rejections are based on the proposition that thermal spraying inherently produces porous coatings, followed by the holding that your Applicant must prove that the references do not inherently teach the formation of porous coatings. This holding of inherency flies directly contrary to the express teachings of the only two applied references that directly address the porosity of coatings formed by thermal spraying. Upadhyaya 6,106,903 expressly teaches that thermal spraying produces void free coatings. See Col. 1, Lns. 65-66,

"The composite material is substantially fully dense, with few if any voids therein."

See also, Col. 5, Lns. 45-49,

"The thermal sprayed mass 64 is formed of the resolidified particles 70 of precomposited powder 30, which have been partially melted on their outer surfaces, forced together at impact upon their target, and resolidified in a dense mass

having few, if any, voids or pores therein."

See also Hagle et al. 5,236,151, Col. 2, Lns. 19-23,

"The skin is a nonporous ceramic material such as yttria-zirconia ceramic that is plasma sprayed onto the face of the porous ceramic on the opposite side from the support base."

The express teaching here is that plasma sprayed coatings on porous bases are "nonporous". Plasma spraying is one well known type of thermal spraying. There is no basis for holding that thermal spraying inherently produces porous coatings.

Many of the outstanding rejections contain the holding that there is no reason for one of ordinary skill in the art to believe that any substantial non-uniformity exists in the skins of the applied references. This assumes a fact not in evidence, namely that the applied references teach porous coatings. As is discussed at length below, they do not. There is no support for this holding.

The rejection of claims 1-3, 6 and 12 as anticipated by Tomita '535 is respectfully traversed. Anticipation requires a teaching of the entire claimed invention within a single reference. There is no teaching or suggestion in Tomita of a porous skin. There are numerous teachings in Tomita that the outer wall should be impervious to gas. See, for example, the following:

"...an outer wall preventing leakage of the exhaust gases and giving mechanical strength thereto." Col. 1, Lns. 62-63.

"...so that the exhaust gases can be prevented from flowing out of the outer wall portion. " Col. 2, Lns 41-42.

"...spraying ceramic slurry to the outer surface of the structure

in order to fill the pores..." Col. 2, Lns. 47-48.

With reference to Figs. 1 and 2: "The outer wall 2 is composed of porous ceramic having a higher bulk density than that of the cleaning portion 1, through which the exhaust gases do not flow." Col. 3, Lns. 14-16.

"The bulk density of the outer periphery of the outer wall 2 is very high so as not to pass the exhaust gases therethrough." Col. 3, Lns. 33-35.

"...the pores to the outer peripheral portion of the three dimensional network structure are completely filled with the sprayed slurry." Col. 3, Lns. 61-63.

"...the slurry is sprayed to the structure so as to fill the pores of the outer periphery thereof..." Col. 4, Lns. 4-5.

With reference to Figs. 4 and 5: "...the third layer 23 has such a high bulk density that the exhaust gases do not pass therethrough." Col. 4, Lns. 29-31.

Claim 1, from which claim 3 depends, recites: "...said ceramic slurry is adhered until the pores opening to said outer peripheral side surface of said foamed body are closed thereby..." Col. 6, Lns. 10-13.

There is nothing in Tomita contrary to these clear teachings that the outer wall must be gas impervious. Tomita is very clear and emphatic that there should be no gas flow through the outer wall. The "6 to 20 cell/in." recital in claim 3 refers to the body of the filter, not the outer wall. This teaching is contrary to and leads away from the present invention.

The rejection of claims 1, 6 and 12 as anticipated by Okada Japanese publication 61-268850 is respectfully traversed. There is no teaching or suggestion of a skin having interconnected porosity. This reference suggests a flame sprayed ceramic dust on a foamed ceramic body followed by the application of a ceramic coating 15. There is no suggestion or teaching that the ceramic 15 should be porous. The ceramic coating 15 appears to be there to seal the porous foamed ceramic. The ceramic coating 15 is different from the spray formed coating 14. There is no teaching here from which one skilled in the art would surmise that the coating 15 is porous. This teaching is contrary to and leads away from the present invention.

The rejection of claims 1, 6 and 12 as anticipated by Japanese publication 63-2873 is respectfully traversed. There is no evidence of record to show that porosity is inherent in flame sprayed coatings. As discussed above, the record is in fact to the contrary.

The rejection of claims 1, 6 and 12 as anticipated by Kallisch DE 3905080 is respectfully traversed. There is no teaching or suggestion of a skin having interconnected porosity. Fig. 1 of Kallisch shows a totally sealed non-porous skin on the sides of the porous foam. The abstract describes the side surfaces as "...preferably totally with a closed layer of refractory material..." This clear teaching of a closed layer is directly contrary to the present invention. There is no basis for a holding of inherency that is contrary to the express teachings of this reference.

The rejection of claims 1, 6 and 12 as anticipated by or obvious over Brockmeyer '621 is respectfully traversed. There is no teaching

or suggestion of a skin having interconnected porosity. Borckmeyer discloses the making of a gasket to seal a porous ceramic filter to a holder. The ceramic filter is intended to filter molten metal. The gasket must have certain characteristics. Among these are preventing the molten metal from reaching the sealing face of the filter holder. See Col. 1, Lns. 55-57. If the gaskets were porous, they could not prevent the molten metal from reaching the sealing face of the holder. It would be contrary to the teachings of the reference to propose the use of a porous gasket. Nowhere in this reference is there any suggestion of a porous gasket. There is no basis for a holding of inherency that is contrary to the express teachings of this reference.

The rejection of claims 1-3, 6 and 12 as anticipated by or obvious over Morris '595 is respectfully traversed. There is no teaching or suggestion of a skin having interconnected porosity. Morris does not disclose the use of a porous coating. The specific disclosure is that the coating should be non-porous. See, for example:

"It is an object of this invention to provide reticulated ceramics having an integral thin ceramic coating to close off the pore phase at selected locations..." Col. 1, Lns. 18-20.

"The surfaces are closed off by applying a dense coating to the reticulated ceramics." Col. 4, Lns. 63-65.

There is no contrary teaching that porous coating should be used. Any suggestion that porous coating should be used flies directly in the face of these express teachings. There is no basis

for a holding of inherency that is contrary to the express teachings of this reference.

The rejection of claims 1, 6 and 12 as anticipated by Shogo Japanese Publication 61-042468 is respectfully traversed. There is no teaching or suggestion of a skin having interconnected porosity. As discussed above, there is no basis for a holding of inherency that is contrary to the express teachings of two cited references.

The rejection of claims 1, 2, 6 and 12 as anticipated by Hagle '151 is respectfully traversed. There is no teaching or suggestion of a skin having interconnected porosity. The express teaching is to the exact contrary. See the discussion above. There is no basis for a holding of inherency that is contrary to the express teachings of this reference.

The rejection of claims 1, 6 and 12 as anticipated by Sherman "Refractory Metal Foams" is respectfully traversed. There is no teaching or suggestion of a skin having interconnected porosity. The caption below the leftmost picture on the first page of this reference states "...then the fully dense outer coating or 'skin' is formed by CVD." By definition, "fully dense" coatings have no porosity. On the third page at the bottom of first column it states "Flexural and tensile properties can be greatly enhanced if an adherent, continuous sheet is applied to the surfaces of the foam." "Continuous" sheets are not porous. This is the only teaching as to the porosity of the skin. There is no teaching of a porous skin. There is no basis for a holding of inherency that is contrary to the express teachings of this reference.

The rejection of claims 1, 3, 6 and 12 as anticipated by Mano '030 is respectfully traversed. There is no teaching or suggestion of a skin having interconnected porosity. The express teaching is that the coating is not porous. See reference numeral 7 in Fig. 7. As discussed above, there is no basis for a holding of inherency that is contrary to both the express teachings of this reference and two of the applied references.

The rejection of claims 1, 6 and 11 as anticipated by Upadhyaya '903 is respectfully traversed. There is no teaching or suggestion of a skin having interconnected porosity. As discussed above, the express teaching is exactly to the contrary. Upadhyaya expressly teaches that thermal spraying produces void free coatings. A holding that the formation of porous coatings is inherent in thermal sprayed coatings flies directly against this express teaching. There is no basis for a holding of inherency that is contrary to the express teachings of this reference.

The rejection of claim 11 as unpatentable over Kallisch (DE 3905080 C1), Brockmeyer "621, Morris "595 in view of Narumiya '478 is respectfully traversed. As discussed at length above, completely absent from this combination of references is any teaching or suggestion of a skin having interconnected porosity. Narumiya does not provide any such teaching. There is no suggestion in this combination of references that there would be any advantage to such a structure.

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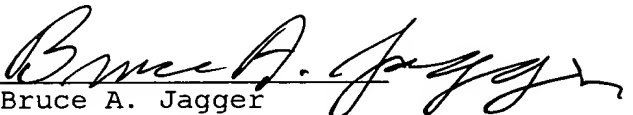
This application is now believed to be in condition for immediate allowance and the prompt issuance of a Notice of Allowance is respectfully solicited.

Respectfully submitted,

BRUNTON & JAGGER

Date: April 18, 2003

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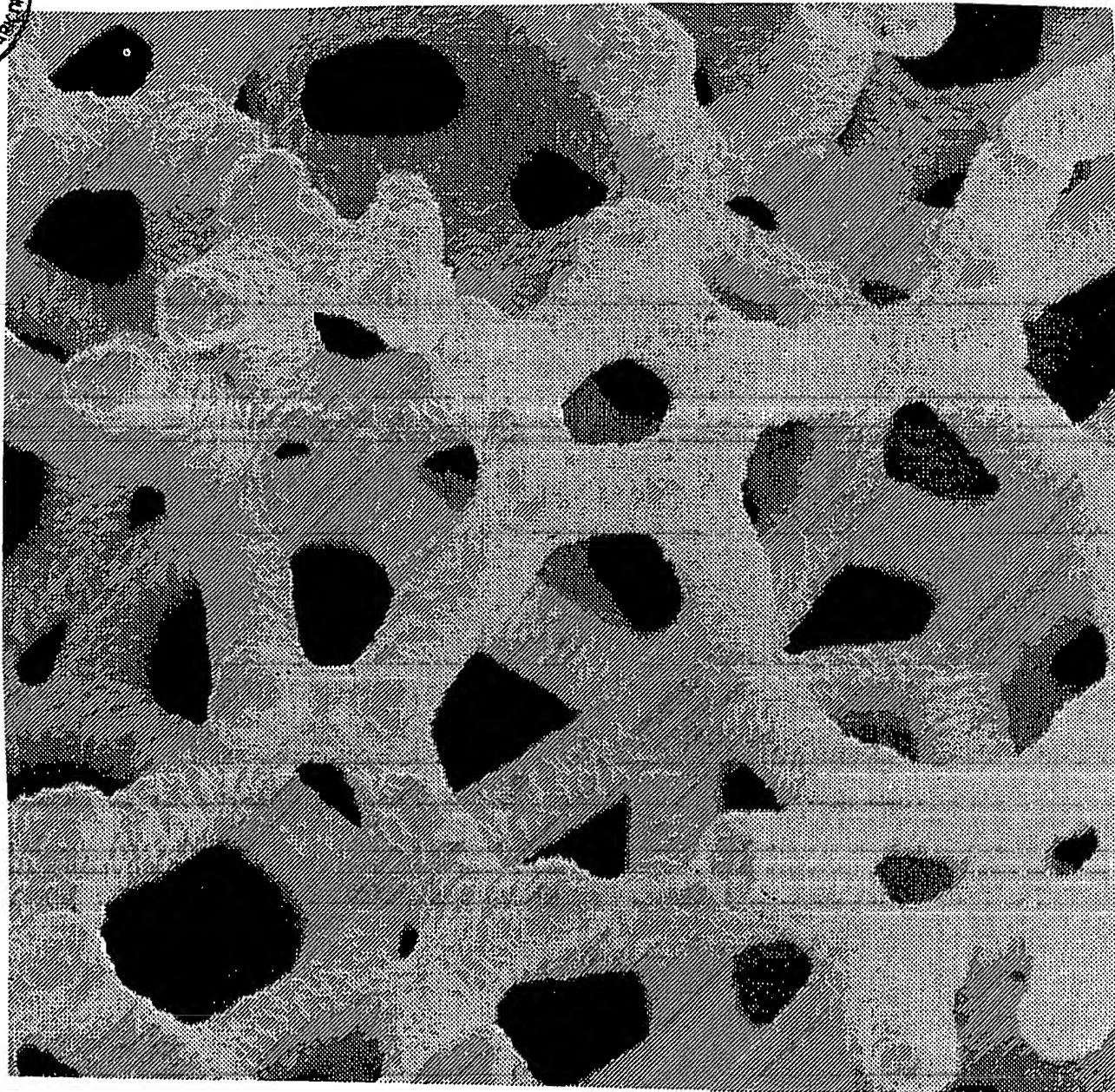


Fig. 1
PRIOR ART

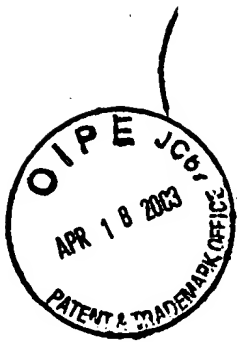


Fig. 2a
PRIOR ART

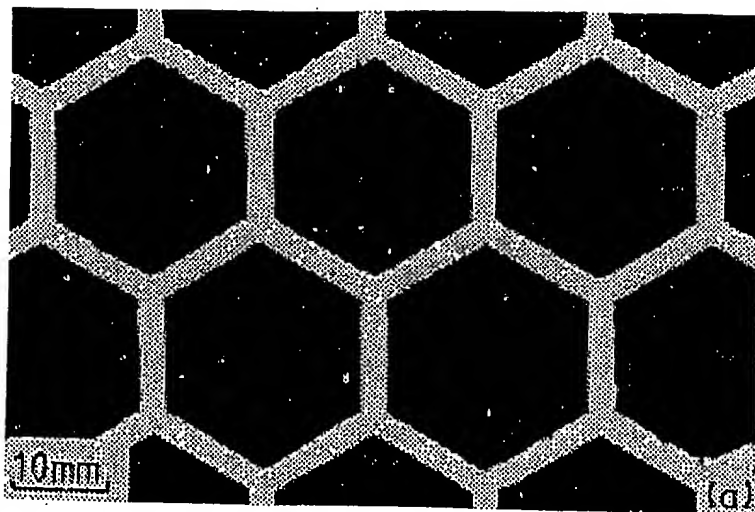


Fig. 2b
PRIOR ART

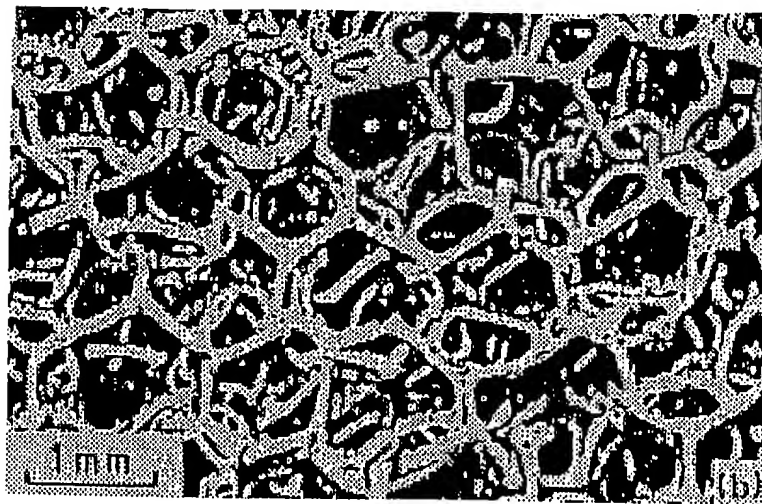


Fig. 2c
PRIOR ART

